Implementing the 5E Instructional Model into an Algebra 1 Solving Equations Unit

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Abstract

In recent years, the education field has increasingly pushed for a focus on student-centered learning. Theories that revolve around student-centered learning are supported by teachers, but teachers are often left with little guidance for how to implement it into their classroom. More specifically, educators have been struggling to determine how to increase student engagement and collaboration in the mathematics classroom. One way for mathematics teachers to provide student-centered learning and encourage engagement and discovery in the classroom is through the 5E instructional model. This model is designed for students to engage, explore, explain, elaborate, and evaluate problem solving. This curriculum project presents 5 sequential Algebra 1 lessons designed around the 5E model to teach the Solving Equations Unit. The lessons present how well this instructional model fits with mathematics instruction to support student learning.
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Introduction

School districts nationwide are pushing for increased student engagement and collaboration in student-centered classrooms. However, teachers often have little guidance on how to incorporate this teaching approach. For example, Project-Based Learning (PBL) is one approach that teachers are encouraged to implement, yet they are often unsure how to incorporate such practices into their classrooms. Providing student-centered instruction often means revamping lessons and materials, which can require a significant amount of time. Additionally, given time constraints and the amount of standards to cover, mathematics teachers often use whole class instruction to present new concepts instead of allowing students to discover mathematical ideas, concepts, and skills themselves. We know we need to provide student-centered instruction, and it took years for mathematicians to generate the mathematics that we teach, so the paradox of classroom realities and the need for student-centered discovery and learning presents difficult realities for teachers. The 5E model fits well within these realities of the mathematics classroom.

The 5E instructional approach includes five areas of focus: engage, explore, explain, elaborate, and evaluate. Most teachers already cover the engage, explain, and evaluate pieces of this model. For example, we use our student’s prior knowledge to engage them in new learning through warm-ups or Do Now’s each day. The explain phase is where the new material is taught. Lastly, the evaluate phase is where we assess student learning, whether formative or summative. The challenge is where the increased student collaboration and student-centered learning comes in. During the explore and elaborate phases, students are using their own knowledge to make discoveries and apply these newly learned skills. The 5E model also includes group work within the elaborate phase, and most mathematics teachers
are excellent at working with small groups to support learning. Through group activities, teachers can facilitate group discussions by guiding students to assist one another through difficulties in the lesson while looking to the teacher as the main source of information. The purpose of this curriculum is to support teachers in developing collaboration in a student-centered classroom by utilizing the 5E instructional model. Most mathematics teachers will find this model to be a good fit for their classrooms because they already implement many of the 5E model components. Thus, altering lessons and accompanying materials and activities will be a lot less overwhelming and time consuming. This project provides five exemplar algebra I lessons on solving equations with keys for all materials being provided in the appendix. It is the authors' hope that teachers experience the simplicity of increasing student engagement and collaboration through the 5E model.

**Literature Review**

**Group Work**

The New York State (NYS) Department of Education, as well as NYS school districts themselves, encourage teachers to increase student collaboration in the classroom. The easiest way to increase student collaboration is through group work or partner activities. Teachers often plan lessons with group work for observations and other opportunities where teaching is observed because it provides the opportunity for others to see students working collaboratively together to reach a goal. However, many teachers take a step back from using this teaching strategy on a regular basis because it can be challenging to steer away from traditional whole class instruction.

Why is utilizing group work to increase student collaboration so beneficial? When working in groups, students develop critical thinking skills, communicate mathematical
discourse, develop teamwork skills, and learn to appreciate and understand of the views of their peers (Sofroniou, 2016). Each of these skill areas encourage active participation in a task which results in increased student learning. In a collaborative learning environment, students can present and share information they discover during a learning task or activity. Edwards (1999) stated that when students were asked about their perception of group work, one student reported, “I think it’s really good, because we’re able to work ... as a team ... you just understand more about maths than you do just by writing down on pen and paper” (p. 4). When students work independently, their misunderstandings or misconceptions can easily go unnoticed. When working collaboratively, students can learn from one another resulting in joint achievement being greater than individual accomplishment (Sofroniou, 2016) as long as group norms establish that all group members must achieve and accomplish the learning tasks. Also, while working with peers, students have more opportunities to work through misunderstandings as they problem solve together.

One concept that mathematics teachers want students to leave the classroom understanding is that problem solving can be looked at in various ways. For example, mathematics problems can be presented algebraically, graphically, analytically, or through the observation of patterns. Working in groups allows students to experience such various problem-solving methods. Edwards and Jones (1999) stated that a student may only view a problem one way, but when groups of students problem solve collaboratively, they are more likely to experience various plausible solutions. Additionally, collaborative group work supports the development of mathematical literacy. For example, Edwards (1999) shared that one student would say something and other students in the group would discuss the idea using different mathematical words and ideas. Group work thus provides the chance for every student to share
their problem-solving processes. Sometimes, all it takes is a little help from a peer to get another student on the right track.

**Zone of Proximal Development**

Although teachers typically assess student learning through their individual work, this does not mean that learning needs to be done independently. Russian psychologist Lev Vygotsky discovered that children first absorb information through simple perceptions and involuntary attention and then develop higher mental functions through social interactions with more advanced peers and adults (Doolittle, 1997). As children move through the progression of these mental functions, they learn to complete tasks with less and less assistance (Doolittle, 1997). This area of functioning is called the zone of proximal development (ZPD). The ZPD is supported through group collaboration in the classroom. Yes, students start developing connections and understanding of new content on their own, but it is with the addition of others knowledge that leads them into higher-order thinking and deeper understandings.

When applied to the classroom, ZPD suggests that peer groups create learning potential where students combine their individual knowledge and expertise of a skill with others to make progress (Doolittle, 1997). Since there are a range of learners in each classroom, there are no two people in the room who will process and understand information the same way. Traditionally, this concept is ignored because teachers expect their students to understand what they are teaching, and problem solve exactly how they demonstrate to do so. Therefore, many students fall between the cracks because individually they may not be able to move past a certain skill level. Utilizing student collaboration through group work allows students to take their expertise, explore the reasoning and viewpoints of others, and construct a shared understanding of the task.
(Doolittle, 1997). Together, they will develop the higher mental functioning we are intending them to reach.

What must be understood about group collaboration is that interactions among students must be reciprocal. Without reciprocal communication, the model does not necessarily produce the desired outcomes. This collaborative environment is characterized by “shared activity, a common goal, continuous communication, co-construction of understanding, proposing and defending their own ideas, and asking their peers to clarify and justify any ideas they do not understand” (Doolittle, 1997, p.89). Therefore, it is essential that students must have the ability to work together appropriately. The collaboration process does not come naturally to some students, so the teacher must assist students in developing the skills necessary to successfully work in this learning environment. For example, the teacher must ensure that students are respecting one another’s ideas and working through them without causing conflict. Students must be taught to work through their own ideas in addition to the reasoning and viewpoints of others and piece together what is needed to accomplish their goal. This curriculum was designed to provide teachers with opportunities to facilitate these types of learning experiences in the hopes that towards the end of the curriculum, students will participate in these groups with more independence and success.

The 5E Instructional Model

Along with incorporating group work, this curriculum project is designed around the 5E instructional model. The five E’s of this model are: engage, explore, explain, elaborate, and evaluate. This instructional model requires teachers to sequence their lessons in a particular order. The sequence of activities includes “introducing the lesson by engaging students with a new concept, having the students explore an idea or skill, explaining the result of the targeted
concept, elaborating on each idea or skill through additional practice, and finally evaluating their progress in a new setting throughout the lesson” (Turan & Matteson, 2021, p.23). Each phase of this model is designed around the progression of student learning. The following outlines what should be achieved within each section of the model: Engage is where students’ prior knowledge is activated and built upon with new knowledge. The purpose of this phase is to motivate student interest and curiosity as they begin expanding their skillset; Explore is as it seems – students explore newly learned concepts or skills and begin discovering how they can apply what they know to new information and begin problem solving to do so; Explain is where the teacher will utilize student feedback as they explain their understandings of the material. The teacher will then supplement student information with formal definitions and academic explanations as needed; Elaborate is where students are challenged to apply the newly learned skill to new and/or real-world situations. This phase will determine the depth of conceptual understanding developed; Evaluate is where overall learning and understanding is assessed. Evaluation of student learning may take place throughout the whole lesson, but this phase will assist in gearing the path of future lessons (Turan & Matteson, 2021).

Teachers often begin teaching the way they were taught mathematics in college, so they have been molded to believe that teaching happens by explaining how to carry out a task and modeling how to do so. However, teachers eventually learn that secondary student learning takes place during discovery because we all process information and problem solving differently. Thus, the beauty of the 5E instructional model is that it provides the bridge for teachers to move from one who is learning upper-level mathematics to one who is the facilitator of developing understandings of mathematics in the classroom. This curriculum was designed to support mathematics teachers in this transition.
The Curriculum

Lesson 1

This lesson is designed for students to solve one-step equations by using inverse operations. Students may need to be reminded of the four basic operations, the opposite of each, and how to “undo” the given operation. The lesson activity consists of a scavenger hunt for students to work collaboratively in pairs as they walk around the room and solve one-step equations shown on the scavenger hunt sheets. The lesson will progress through the 5E Model as students engage with their prior knowledge, explore new concepts, and apply new skills.

The 5E Model

<table>
<thead>
<tr>
<th>Engage</th>
<th>Students will complete a warm-up activity where they are asked to identify inverse operations (ex: opposite of addition is ________).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explore</td>
<td>After the warm-up activity, students will be shown 4 expressions. Each expression will contain a number and a variable that will be attached by each of the 4 operations: x+3, x-3, 3x, x/3. The students will be asked to use the inverse operations discussed during the warm-up to figure out how they could remove the number that is attached to the variable. Students will complete this on their own as the teacher observes their thinking. Then, the teacher will facilitate a discussion by asking students to share their thinking, whether right or wrong.</td>
</tr>
<tr>
<td>Explain</td>
<td>Teacher will explain how to solve one-step linear equations by using inverse operations as students take notes in their packet.</td>
</tr>
<tr>
<td>Elaborate</td>
<td>Students will participate in a partner scavenger hunt activity. One-step equations will be posted around the room and students will work with a partner (or group) to solve the one-step equations on the answer sheet. Each student will solve the equation and check their work with their partner. Once they agree, they will find their answer on another sheet around the room. This process will continue until they are back where they started. This is a self-correction activity since students will not be able to find their answer around the room if they solve the equation incorrectly. The teacher will facilitate learning during this time.</td>
</tr>
<tr>
<td>Evaluate</td>
<td>Students will be informally assessed during the activity. Students will complete an exit ticket that asks them to solve 4 one-step equations (each operation).</td>
</tr>
<tr>
<td><strong>Lesson Topic</strong></td>
<td>Solving one-step linear equations</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td><strong>Standard</strong></td>
<td>AI-A.REI.3 - Solve linear equations in one variable, including equations with coefficients represented by letters.</td>
</tr>
<tr>
<td><strong>Objectives/Goals</strong></td>
<td>Students will be able to solve one-step linear equations using inverse operations.</td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td>Warm-up slides, blank sheet of paper, solving equations packet pgs. 1-2 (solving one-step equations), scavenger hunt activity, clipboard, calculators, exit ticket</td>
</tr>
</tbody>
</table>

**Procedures/Lesson Activities**

**Introduction:**
1. Students will complete warm-up activity. Teacher will review answers and further the discussion into the use of inverse operations.

**Instruction/Guided Practice:**
2. Teacher will discuss how to solve one-step equations while writing notes on the board as students follow along in their packets (pg. 1).
3. Teacher will go through guided practice examples (pgs. 1-2) within the notes and review concepts in more depth as needed. Students will complete the “you try” problems on page 2 independently.

**Lesson Activity:**
4. Teacher will divide students into groups of 2-3.
5. Students will choose a scavenger hunt sheet around the room to start at and begin solving the one-step equation on the bottom of the sheet.
6. Students will show their work and record all answers on the recording sheet. (Each student will work on their own sheet)
7. Students will be instructed to check their work with their partner once the equation is solved and adjust their work if needed.
8. Once each partner agrees with the answer, they will find their answer on the top of another sheet around the room.
9. Students will be instructed to continue this process until they are back where they started (or set a time limit).

**Closure:**
10. Students will independently complete the exit ticket.

**Assessments**
- *Informal* – Completion of guided practice examples, scavenger hunt activity (response sheet)
- *Formal* – Exit ticket
Materials

Warm-up/Introduction Slides:

- Slides 1-4

Link: https://docs.google.com/presentation/d/1UoH6sSCW2knhrwe-9mVTtEWMUdwPWYLjFn8czvd5HHA/edit?usp=sharing
Identify the four basic operations and their opposites:

______________________  ___________________________
______________________  ___________________________
______________________  ___________________________
______________________  ___________________________

Solving One-Step Equations

1. Undo the addition or subtraction by using inverse operations.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>d + 10 = 25</td>
</tr>
<tr>
<td>2</td>
<td>y - 4 = 7</td>
</tr>
<tr>
<td>3</td>
<td>6 + x = 12</td>
</tr>
<tr>
<td>4</td>
<td>-5 + g = 8</td>
</tr>
</tbody>
</table>

Lesson 1 - Solving One-Step Equations

<table>
<thead>
<tr>
<th>Standard</th>
<th>AI-A.REI.3 - Solve linear equations in one variable, including equations with coefficients represented by letters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson Objective</td>
<td>Students will be able to solve one-step linear equations using inverse operations.</td>
</tr>
</tbody>
</table>
You Try!

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>5</td>
<td>( x + 8 = 30 )</td>
</tr>
<tr>
<td>6</td>
<td>( b - 3 = 4 )</td>
</tr>
<tr>
<td>7</td>
<td>( 2 + y = 12 )</td>
</tr>
<tr>
<td>8</td>
<td>( -4 + d = 16 )</td>
</tr>
</tbody>
</table>

2. Undo the division or multiplication by using inverse operations.

* To “get rid” of a fraction, multiply by the _________________.

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>( 5y = 25 )</td>
</tr>
<tr>
<td>2</td>
<td>( \frac{k}{3} = 9 )</td>
</tr>
<tr>
<td>3</td>
<td>( -3x = 36 )</td>
</tr>
<tr>
<td>4</td>
<td>( \frac{g}{5} = 6 )</td>
</tr>
</tbody>
</table>

You Try!

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>( 6n = 24 )</td>
</tr>
<tr>
<td>6</td>
<td>( \frac{b}{4} = 7 )</td>
</tr>
<tr>
<td>7</td>
<td>( -10x = 50 )</td>
</tr>
<tr>
<td>8</td>
<td>( \frac{g}{2} = 10 )</td>
</tr>
</tbody>
</table>
Exit Ticket

Solve the one-step equations below using inverse operations:

1. \( x + 5 = 20 \)
2. \( d - 12 = 6 \)
3. \( 4x = 28 \)
4. \( \frac{k}{3} = 7 \)
Solving One-Step Equations

Scavenger Hunt

Directions: Use this sheet to record your work during the scavenger hunt. Copy down the problem and solve it in the box. Circle your final answer.
Answer:

\[ x = 8 \]

Solve for \( x \):

\[ 4x = 20 \]
Solve for $x$:

$$x + 5 = 13$$

Answer:

$$x = -6$$
Answer:

\[ x = 18 \]

Solve for \( x \):

\[ x - 8 = 3 \]
Answer:

\[ x = 11 \]

Solve for \( x \):

\[ \frac{x}{2} = 10 \]
Answer:

\[ x = 0 \]

Solve for \( x \):

\[ 7x = 49 \]
Answer:

\[ x = 60 \]

Solve for \( x \):

\[ X + 12 = 6 \]
Answer:

\[ x = -24 \]

Solve for \( x \):

\[ x - 3 = 15 \]
Answer:

\[ x = -38 \]

Solve for \( x \):

\[ \frac{x}{6} = -4 \]
Answer:

\[ x = 7 \]

Solve for \( x \):

\[ 9x = 36 \]
Answer:

\[ x = 5 \]

Solve for \( x \):

\[ X + 14 = -24 \]
Answer:

\[ x = 20 \]

Solve for \( x \):

\[ x - 1 = -1 \]
Answer:

\[ x = 4 \]

Solve for \( x \): 

\[ \frac{x}{5} = 12 \]
Lesson 2

This lesson is designed for students to solve two-step equations by using inverse operations. Students may need to be reminded of the four basic operations, the opposite of each, and how to “undo” the given operation. The lesson activity consists of an escape room for students to work on collaboratively in pairs as they use their new knowledge of solving two-step equations to crack the code and “escape the room.” The lesson will progress through the 5E Model as students engage with their prior knowledge, explore new concepts, and apply new skills.

The 5E Model

<table>
<thead>
<tr>
<th>Engage</th>
<th>Students will complete a warm-up activity where they are asked to solve one-step linear equations (1 problem each - addition, subtraction, multiplication, and division).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explore</td>
<td>After the warm-up activity, students will be given a simple two-step equation and will be asked to use their knowledge of inverse operations to figure out which step would be carried out first based on the two needed inverse operations they recognize. In the example 3x+5=20, they will decide if they would subtract 5 first or divide by 3 first. The students would use a blank sheet of paper to record their ideas and determine which they think would come first through trial and error. Students will complete this on their own as the teacher observes their thinking. Then, the teacher will have students share their thoughts and reasoning while the students build off one another’s ideas.</td>
</tr>
<tr>
<td>Explain</td>
<td>Teacher will explain the steps for how to solve two-step linear equations by using inverse operations as students take notes in their packet.</td>
</tr>
<tr>
<td>Elaborate</td>
<td>In partners or small groups, students will participate in an escape room activity by solving two-step equations correctly in order to “escape.” The correct answers will lead the students to a code that will allow them to “escape.” The students will use their Chromebooks to fill in the accompanying Google form and see if their code is correct. If incorrect, they will review their work and try to work out their mistakes with one another. The teacher will facilitate learning during this time.</td>
</tr>
<tr>
<td>Evaluate</td>
<td>Students will be informally assessed during the activity. In their partners/groups, students will complete an exit ticket that asks them to create a two-step equation and solve it with their partner(s). Each partner will have their own sheet to solve the equation on.</td>
</tr>
<tr>
<td><strong>Lesson Topic</strong></td>
<td>Solving two-step linear equations</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td><strong>Standard</strong></td>
<td>AI-A.REI.3 - Solve linear equations in one variable, including equations with coefficients represented by letters.</td>
</tr>
<tr>
<td><strong>Objectives/Goals</strong></td>
<td>Students will be able to solve two-step linear equations using inverse operations.</td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td>Warm-up slides, blank sheet of paper, solving equations packet pgs. 3-4 (solving two-step equations), escape room activity, sheet to show work, Google forms code check, Chromebooks, calculators, exit ticket</td>
</tr>
</tbody>
</table>
| **Procedures/Lesson Activities** | **Introduction:**  
1. Students will complete warm-up activity. Teacher will review answers and facilitate a discussion of inverse operations used in lesson 1.  
**Instruction/Guided Practice:**  
2. Teacher will discuss how to solve two-step equations while writing notes on the board as students follow along in their packets (pg. 3).  
3. Teacher will go through guided practice examples (pg. 3) within the notes and review concepts in more depth as needed. Students will complete the “you try” problems on page 4 independently.  
**Lesson Activity:**  
4. Teacher will divide students into groups of 2-3.  
5. Students will work together to solve the two-step equations for Room 1 with their partners.  
6. Students will be instructed to check their work with their partner once the equation is solved and adjust their work if needed.  
7. Students will determine the code by looking back at their answers and filling in the code on the escape room sheet.  
8. Once the group determines the code, one student will log on to their Chromebook fill in the Google form for their group. If the code is correct, they will move on to Room 2. If they are incorrect, they will look over their work and adjust as needed.  
9. The activity will be completed when both codes are correct (directions on Google form).  
**Closure:**  
10. Students will work together in their group to complete the exit ticket.  

| **Assessments** | - *Informal* – Completion of guided practice examples, escape room activity (including google forms code check)  
- *Formal* – Exit ticket |
Materials

Warm-up/Introduction Slides:

- Slides 5-8

Link: https://docs.google.com/presentation/d/1UoH6sSCW2knhrwe-9mVTtEWMUdwPWYLiFn8czvd5HHA/edit?usp=sharing
Name: _______________________________    Date: ________________

Lesson 2 - Solving Two-Step Equations

<table>
<thead>
<tr>
<th>Standard</th>
<th>Al-A.REI.3 - Solve linear equations in one variable, including equations with coefficients represented by letters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson Objective</td>
<td>Students will be able to solve two-step linear equations using inverse operations.</td>
</tr>
</tbody>
</table>

What are the steps for solving one-step equations?

1. Undo __________________ by __________________ the constant from both sides of the equation.

2. Undo __________________ by __________________ the constant on both sides of the equation.

3. Undo __________________ by __________________ the coefficient on both sides of the equation.

4. Undo __________________ by __________________ the coefficient from both sides of the equation.

Solving Two-Step Equations

1. Undo the addition or subtraction by using inverse operations.

2. Undo the multiplication or division by using inverse operations.

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>$2x + 5 = 25$</td>
</tr>
<tr>
<td>2</td>
<td>$\frac{d}{2} + 8 = 12$</td>
</tr>
<tr>
<td>3</td>
<td>$5y - 3 = 7$</td>
</tr>
<tr>
<td>4</td>
<td>$\frac{m}{3} - 12 = 6$</td>
</tr>
</tbody>
</table>
### You Try!

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>5</td>
<td>$3x + 8 = 26$</td>
</tr>
<tr>
<td>6</td>
<td>$\frac{d}{7} + 4 = 9$</td>
</tr>
<tr>
<td>7</td>
<td>$7y - 10 = 25$</td>
</tr>
<tr>
<td>8</td>
<td>$\frac{p}{7} + 2 = 3$</td>
</tr>
</tbody>
</table>

### Extra Practice

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$10 + \frac{x}{2} = 14$</td>
</tr>
<tr>
<td></td>
<td>$8 - n = 20$</td>
</tr>
<tr>
<td></td>
<td>$23 + n = 13$</td>
</tr>
<tr>
<td></td>
<td>$5 - \frac{y}{10} = 8$</td>
</tr>
</tbody>
</table>
Escape Room

Solving Two-Step Equations

Directions: Solve the following equations to get the code to escape Room 1. Once you get the code, type it into the google form to see if you are correct. Follow the directions on the form.

1) $2x + 4 = 10 \quad x = \underline{______}

2) $6x - 1 = 29 \quad x = \underline{______}

3) $3x - 8 = 13 \quad x = \underline{______}

4) $9x + 5 = 23 \quad x = \underline{______}

Code: 1 2 3 4
Directions: Solve the following equations to get the code to escape Room 2. Once you get the code, type it into the google form to see if you are correct. Follow the directions on the form.

1) \( \frac{x}{3} - 1 = 2 \) \( x = \) ______

2) \( \frac{x}{2} + 10 = 12 \) \( x = \) ______

3) \( \frac{x}{5} + 8 = 9 \) \( x = \) ______

4) \( \frac{x}{7} + 5 = 6 \) \( x = \) ______

Code: ______ ______ ______ ______
Solving Two-Step Equations

Escape Room

Directions: Use this sheet to show your work as needed for the escape room activity.
Google forms Code Check:

https://docs.google.com/forms/d/e/1FAIpQLSei5AVmb28MFil0VkJW0ZnSRClp7jcbLNO
nEINTXBRXUg/viewform?usp=sharing
Exit Ticket

Create a two-step equation with your partner and then solve it below:

Equation: _________________________________

Answer: ____________________
Lesson 3

This lesson is designed for students to solve multi-step equations, with variables on one side, by combining like terms. Students may need to be reminded of how to solve one and two-step equations, involving how to “undo” the given operations. The lesson activity consists of a group activity where students will work together to solve a given equation. Along with working collaboratively in groups to solve the equation, the groups will take turns presenting how to solve the given equations throughout the lesson activity. The lesson will progress through the 5E Model as students engage with their prior knowledge, explore new concepts, and apply new skills.

The 5E Model

<table>
<thead>
<tr>
<th><strong>Engage</strong></th>
<th>Students will complete a warm-up activity where they are asked to solve two-step linear equations (2 problems – all four operations will be used).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Explore</strong></td>
<td>After the warm-up activity, the teacher will ask students how they would simplify the expression 2x+5x to review the previously learned skill of combining like terms. The students will be led to guide the discussion with one another and work off each other’s ideas. The teacher will then give another example of combining like terms and ask the students to come up with two more for the class to simplify. The teacher will then give the students an example of a multi-step equation to attempt to solve on their own using all the knowledge they have thus far about solving equations and combining like terms: 4x + 2x – 10 = 50. The students would use a blank sheet of paper to try the problem. Students will complete this on their own as the teacher observes their thinking. Then, the teacher will have students share their thoughts and reasoning while the students build off one another’s ideas and why some processes may or may not work.</td>
</tr>
<tr>
<td><strong>Explain</strong></td>
<td>Teacher will explain the steps for how to solve multi-step linear equations by using inverse operations and combining like terms as students take notes in their packet.</td>
</tr>
<tr>
<td>Elaborate</td>
<td>The class will break into small groups and work together to solve multi-step equations. The teacher will present an equation on the board, and every student will need to solve the equation on their whiteboard. As the students work, they will help one another to solve the equation, talking through the steps and helping each other when stuck. The teacher will assist students in collaborating with one another during this activity. The group that finishes first and is checked by the teacher will come up to the board and walk the class through the steps for solving the equation. They will write on the board and explain each step as the rest of the class follows and assesses whether they believe it is correct. Students in other groups may agree or disagree and share their thoughts with the presenting group.</td>
</tr>
<tr>
<td>Evaluate</td>
<td>Students will be informally assessed during the activity. Students will individually complete an exit ticket that asks them to solve one multi-step linear equation.</td>
</tr>
<tr>
<td><strong>Algebra 1</strong></td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td></td>
</tr>
<tr>
<td><strong>Lesson Topic</strong></td>
<td>Solving multi-step linear equations</td>
</tr>
<tr>
<td><strong>Standard</strong></td>
<td>AI-A.REI.3 - Solve linear equations in one variable, including equations with coefficients represented by letters.</td>
</tr>
<tr>
<td><strong>Objectives/Goals</strong></td>
<td>Students will be able to solve multi-step linear equations with variables on one side by combining like terms and using inverse operations.</td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td>Warm-up slides, blank sheet of paper, solving equations packet pgs. 5-7 (solving multi-step equations), Google slides presentation (solving multi-step equations activity), whiteboards (markers, erasers), calculators, exit ticket</td>
</tr>
<tr>
<td><strong>Procedures/Lesson Activities</strong></td>
<td><strong>Introduction:</strong> 1. Students will complete warm-up activity. Teacher will review answers and facilitate a discussion of combining like terms and using inverse operations as learned in previous lessons. <strong>Instruction/Guided Practice:</strong> 2. Teacher will discuss how to solve multi-step equations while writing notes on the board as students follow along in their packets (pg. 6). 3. Teacher will go through guided practice examples (pg. 6) within the notes and review concepts in more depth as needed. Students will complete the “you try” problems on page 7 independently. <strong>Lesson Activity:</strong> 4. Teacher will divide students into groups of 3-4. 5. Students will work together to solve the multi-step equations on the first slide presented on the board. Students will use the whiteboards to show their work. 6. Once the group is done, they will call the teacher over to check their answer. If the answer is correct, the group will then come up to the board to teach the rest of the class how to solve the problem. 7. Students will share their ideas with the presenting group as they go through the steps of solving the equation. The teacher will facilitate discussion during this time. 8. This process will continue until all 6 questions are complete and gone over as a class. <strong>Closure:</strong> 9. Students will work independently to complete the exit ticket.</td>
</tr>
<tr>
<td><strong>Assessments</strong></td>
<td>- <em>Informal</em> – Completion of guided practice examples, multi-step equations group presentation activity  - <em>Formal</em> – Exit ticket</td>
</tr>
</tbody>
</table>
Materials

Warm-up/Introduction Slides:

- Slides 9-12

Link: https://docs.google.com/presentation/d/1UoH6sSCW2knhrwe-9mVTtEWMUdwPWYLjFn8czvd5HHA/edit?usp=sharing
Lesson 3 - Solving Multi-Step Equations

<table>
<thead>
<tr>
<th>Standard</th>
<th>AI-A.REI.3 - Solve linear equations in one variable, including equations with coefficients represented by letters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson Objective</td>
<td>Students will be able to solve multi-step linear equations by combining like terms and using inverse operations.</td>
</tr>
</tbody>
</table>

How would you simplify the following expression?

\[ 2x + 5x = \]

- This process is called _____________________________________________

Try solving the following equation based on what you know about combining like terms and inverse operations:

\[ 4x + 2x - 10 = 50 \]
Solving Multi-Step Equations

Steps:

1. _________________ like terms

2. **Solve** for the variable using inverse operations

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>$10x + 6x = 64$</td>
</tr>
<tr>
<td>②</td>
<td>$2x + 1 - 5 = -20$</td>
</tr>
<tr>
<td>③</td>
<td>$4m - 6m + 2 = 50$</td>
</tr>
<tr>
<td>④</td>
<td>$8 - 3a + 1 = 27$</td>
</tr>
</tbody>
</table>
### You Try!

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>$-12y + 6y = 42$</td>
</tr>
<tr>
<td>6</td>
<td>$5r - r + 16 = 24$</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>$6 - 9x + 14 = 83$</td>
</tr>
<tr>
<td>8</td>
<td>$-4n - 7 - 3n + 4 = 25$</td>
</tr>
</tbody>
</table>

### Extra Practice

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$8x - 3x + 12 - 3 = 79$</td>
</tr>
<tr>
<td></td>
<td>$116 = -25n + 7 - 2n + 1$</td>
</tr>
</tbody>
</table>
Activity Slides

Google Slides Link:
https://docs.google.com/presentation/d/1ImTBVE9FohV6uraynIcdnu96sEN0lMrhMdPvg0KG7DjI/edit?usp=sharing
Solve for x:

3rd QUESTION
9x - 3x + 4 = 40

x = __6__

4th QUESTION
4x - 7 + 5x = 74

x = __9__

5th QUESTION
x + 12 - 6x = 27

x = __-3__

6th (LAST) QUESTION
8 + 3x - 2 + x = 54

x = __12__

Solve for x:

2 + 3x - 8x + 1 = 53

x = __-10__

GREAT WORK!
Exit Ticket

Solve the multi-step equation below (show ALL work!)

\[ 4x - 20 + 6x = 50 \]
Lesson 4

This lesson is designed for students to solve multi-step equations, with variables on one side, by distributing and combining like terms. Students may need to be reminded of how to solve multi-step equations with combining like terms as well as simplifying expressions by using the distributive property. The lesson activity consists of a group activity where students will work together to solve a given equation and successfully complete the game of “Hangman.” The lesson will progress through the 5E Model as students engage with their prior knowledge, explore new concepts, and apply new skills.

The 5E Model

<table>
<thead>
<tr>
<th><strong>Engage</strong></th>
<th>Students will complete a warm-up activity where they are asked to solve multi-step linear equations with variables on one side of the equal sign (1 problems – only combining like terms).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Explore</strong></td>
<td>After the warm-up activity, the teacher will show the students two expressions to review the previously learned skill of distributing: 3(x+2) and 4(x-5). The students will be asked to simplify the two expressions independently. Once complete, the teacher will have the students explain how they simplified the expressions: by using the distributive property. The teacher will then show the students the following problem and ask them to attempt to solve it on a blank sheet of paper using the knowledge they have about solving linear equations and distributing: 2(x+3)+x=18. Then, the teacher will have students share their thoughts and reasoning while the students build off one another’s ideas and why some processes may or may not work.</td>
</tr>
<tr>
<td><strong>Explain</strong></td>
<td>Teacher will explain the steps for how to solve multi-step linear equations that involve distributing, combining like terms, and inverse operations as students take notes in their packet.</td>
</tr>
<tr>
<td>Elaborate</td>
<td>Students will break into partners and play a “hangman game” with one another. One student will start by choosing a letter on the page. Both partners will then solve the equation on their answer sheet and see if they agree on their answer. If they do not, they will review their work until they agree. If they do agree, then they will check if that answer is shown as one of the hangman letters. If it is, they write the letter on the line, and if not, they draw a body part on the hangman. The next partner would choose the next letter, and this will continue until they complete the hangman word. The teacher will assist students in collaborating with one another during this activity.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Evaluate</td>
<td>Students will be informally assessed during the activity. Students will individually complete an exit ticket that asks them to solve one multi-step linear equation with distribution.</td>
</tr>
</tbody>
</table>
## Algebra 1

<table>
<thead>
<tr>
<th>Lesson Topic</th>
<th>Solving multi-step linear equations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard</strong></td>
<td>AI-A.REI.3 - Solve linear equations in one variable, including equations with coefficients represented by letters.</td>
</tr>
<tr>
<td><strong>Objectives/Goals</strong></td>
<td>Students will be able to solve multi-step linear equations with variables on one side by distributing, combining like terms, and using inverse operations.</td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td>Warm-up slides, blank sheet of paper, solving equations packet pgs. 8-9 (solving multi-step equations - distributing), Hangman activity sheet, whiteboards (markers, erasers), calculators, exit ticket</td>
</tr>
<tr>
<td><strong>Procedures/Lesson Activities</strong></td>
<td><strong>Introduction:</strong>&lt;br&gt;1. Students will complete warm-up activity. Teacher will review answers and facilitate a discussion of using the distributive property as learned in previous lessons.&lt;br&gt;&lt;br&gt;<strong>Instruction/Guided Practice:</strong>&lt;br&gt;2. Teacher will discuss how to solve multi-step equations involving distribution while writing notes on the board as students follow along in their packets (pg. 8).&lt;br&gt;3. Teacher will go through guided practice examples (pg. 8) within the notes and review concepts in more depth as needed. Students will complete the “you try” problems on page 9 independently.</td>
</tr>
<tr>
<td><strong>Lesson Activity:</strong></td>
<td>4. Teacher will divide students into groups of 2-3.&lt;br&gt;5. Students will work together successfully complete the game of Hangman.&lt;br&gt;6. Once student will choose a letter to begin with, and both students will solve the multi-step equation on their whiteboards.&lt;br&gt;7. Students will check each other’s work and determine if that letter is one of the Hangman letters. If yes, they fill in the letter and if not, they draw a part of the Hangman.&lt;br&gt;8. This process will continue until they figure out the word. The teacher will facilitate collaborative group work during this time.</td>
</tr>
<tr>
<td><strong>Closure:</strong></td>
<td>9. Students will work independently to complete the exit ticket.</td>
</tr>
<tr>
<td><strong>Assessments</strong></td>
<td>- <em>Informal</em> – Completion of guided practice examples, multi-step equations Hangman activity&lt;br&gt;- <em>Formal</em> – Exit ticket</td>
</tr>
</tbody>
</table>
Materials

Warm-up/Introduction Slides:

- Slides 13-16

Link: https://docs.google.com/presentation/d/1UoH6sSCW2knhrwe-9mVTtEWMUdwPWYLjFn8czvd5HHA/edit?usp=sharing
Lesson 4 - Solving Multi-Step Equations

<table>
<thead>
<tr>
<th>Standard</th>
<th>Al-A.REI.3 - Solve linear equations in one variable, including equations with coefficients represented by letters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson Objective</td>
<td>Students will be able to solve multi-step linear equations using the distributive property, combining like terms, and inverse operations.</td>
</tr>
</tbody>
</table>

How would you simplify the following expressions?

1. \( 3(x + 2) = \) __________

2. \( 4(x - 5) = \) __________

❖ This property is called _________________ _________________

Try solving the following equation based on what you know about the distributive property, combining like terms and inverse operations:

\[
2(x + 3) + x = 18
\]
Solving Multi-Step Equations

Steps:
1. ______________________ (if necessary)
2. ______________________ like terms
3. **Solve** for the variable using inverse operations

<table>
<thead>
<tr>
<th></th>
<th>Equation 1</th>
<th>Equation 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$-7(3x - 1) = 91$</td>
<td>$2(x + 1) = -20$</td>
</tr>
<tr>
<td>2</td>
<td>$5(3m + 10) = 125$</td>
<td>$3a + 2(5a - 3) = 7$</td>
</tr>
</tbody>
</table>
### You Try!

<table>
<thead>
<tr>
<th>Question</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>⑤</td>
<td>$-4(7y + 5) = -160$</td>
</tr>
<tr>
<td>⑥</td>
<td>$-3(n + 7) = -6$</td>
</tr>
<tr>
<td>⑦</td>
<td>$4(2x - 1) = 44$</td>
</tr>
<tr>
<td>⑧</td>
<td>$k - 3(2k - 7) = 76$</td>
</tr>
</tbody>
</table>

### Extra Practice

<table>
<thead>
<tr>
<th>Equation</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>$15 - 5(4x - 7) = 50$</td>
<td></td>
</tr>
<tr>
<td>$4 = 16y - 4(5y - 7)$</td>
<td></td>
</tr>
</tbody>
</table>
Hangman

Solving Multi-Step Equations

Directions: You and your partner will try to figure out the Hangman’s favorite food by solving the equations below. One partner will start by choosing a letter and solving that equation. When you get the answer, see if it matches any of the Hangman’s letters. If yes, write the letter on the line. If not, draw a part of the Hangman’s body and your partner will choose the next letter. Good luck!

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td><strong>M</strong></td>
<td><strong>O</strong></td>
</tr>
<tr>
<td>$5x + 2(x-3) = 50$</td>
<td>$6(3-x) = 54$</td>
<td>$5(x-4) = 30$</td>
</tr>
<tr>
<td><strong>I</strong></td>
<td><strong>G</strong></td>
<td><strong>N</strong></td>
</tr>
<tr>
<td>$8x - x = 28$</td>
<td>$2(x+3) - 4 = 36$</td>
<td>$-12x + 20x = 40$</td>
</tr>
<tr>
<td><strong>L</strong></td>
<td><strong>P</strong></td>
<td><strong>C</strong></td>
</tr>
<tr>
<td>$9(x-1) + 5x = 33$</td>
<td>$-4(2x+1) = 76$</td>
<td>$3 - 7(x-5) = 73$</td>
</tr>
<tr>
<td><strong>R</strong></td>
<td><strong>W</strong></td>
<td><strong>E</strong></td>
</tr>
<tr>
<td>$10 - 2(6x-2) = 122$</td>
<td>$-(x-2) + 3x = 28$</td>
<td>$6(7x-8) = -6$</td>
</tr>
<tr>
<td><strong>T</strong></td>
<td><strong>U</strong></td>
<td><strong>Y</strong></td>
</tr>
<tr>
<td>$8(x+9) = 88$</td>
<td>$4(3x-5) = 104$</td>
<td>$36x + 4x = -120$</td>
</tr>
<tr>
<td><strong>Z</strong></td>
<td><strong>H</strong></td>
<td><strong>S</strong></td>
</tr>
<tr>
<td>$-2x + 3(2-4x) = 160$</td>
<td>$18x - 6x = 72$</td>
<td>$12 - 3(x-1) = 2.7$</td>
</tr>
</tbody>
</table>

$x=2$  $x=8$  $x=-5$  $x=10$  $x=-4$
Exit Ticket

Solve the multi-step equation below (show ALL work!)

\[ 3(x + 5) - 2 = 40 \]
Lesson 5

This lesson is designed for students to solve two-step and multi-step equations, with variables on one side, by distributing, combining like terms and using inverse operations. Students may need to be reminded of the steps for solving multi-step equations. The lesson activity consists of a collaborative “roundtable” activity where students will work together to solve a given equation step-by-step. Students will be working independently throughout the activity, but the group will collectively work together to solve the equation in its entirety. The lesson will progress through the 5E Model as students engage with their prior knowledge, explore new concepts, and apply new skills.

The 5E Model

<table>
<thead>
<tr>
<th>Engage</th>
<th>(Five minutes) Students will participate in a class Blooket (<a href="https://www.blooket.com/">https://www.blooket.com/</a>) that assesses the following skills: solving one-step equations, combining like terms, and the distributive property. Students must participate using their Chromebooks.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explore</td>
<td>Teacher will present a multi-step equation on the board and students will explain the steps for how to solve the equation: 3(x+2) – 4 = 17. The teacher will follow the students’ directions, whether right or wrong, and have them adjust the steps as needed until they reach the correct answer. Teacher will encourage student participation and discussion during this time.</td>
</tr>
<tr>
<td>Explain</td>
<td>Students will participate in a “roundtable” activity in groups. The teacher will explain how to carry out the activity and how the students will be working together to solve the problem, even though they are completing the work independently. The teacher will explain each step of the activity as it is presented on the board (will remain there for the duration of the activity).</td>
</tr>
<tr>
<td>Elaborate</td>
<td>The teacher will break the class into groups (4/group is ideal). The students will be given an equation on the board. They must write the first step for solving that equation on their activity sheet and stop after that step. Once everyone finishes, the students will pass their paper along to another group member - left or right (be consistent for each round). That classmate will check their work. If anything is incorrect, the student must use their colored pen to correct the work. Then, they will continue the next step for solving the equation (in the same box). This process will continue until the problem is solved. Each student will get back their original (by default if groups of 4, papers will be returned if not). The group will discuss their findings and see how they did through each step, seeing corrections and discussing them (if any). The teacher will then move on to the next problem and continue this process.</td>
</tr>
<tr>
<td>Evaluate</td>
<td>Students will be informally assessed during the activity. Students will individually complete an exit ticket that asks them to solve one multi-step linear equation.</td>
</tr>
</tbody>
</table>
Algebra 1

**Lesson Topic**  
Solving multi-step linear equations

**Standard**  
AI-A.REI.3 - Solve linear equations in one variable, including equations with coefficients represented by letters.

**Objectives/Goals**  
Students will be able to solve one, two, and multi-step equations.

**Materials**  
Chromebooks, whiteboards (markers, erasers), warm-up slides, roundtable slides presentation, roundtable activity sheet, colored pen, calculators, exit ticket

**Procedures/Lesson Activities**

**Introduction:**
1. Students will participate in a class Blooket activity using their Chromebooks. Students will use whiteboards to do their work on throughout the game. Teacher will assist students as needed.
2. Teacher will present a multi-step equation on the board and students will solve it independently on their whiteboards.
3. The students will walk the teacher through the steps for how to solve the multi-step equation. The teacher will follow the steps and students discuss right/wrong processes with one another until the equation is solved.

**Instruction/Guided Practice:**
4. Teacher will present the directions on the board for the roundtable activity. The teacher will demonstrate a full example to the students to ensure understanding of the activity.

**Lesson Activity:**
5. Teacher will divide students into groups of 3-4.
6. Students will write down the first equation (presented on the board) in box #1 of their activity sheet.
7. Students will write the first step for solving the equation and stop.
8. Students will pass their paper to the next group member. Students will review the work shown and make any necessary corrections with their colored pen.
9. Once correct, the students will continue the next step for solving the equation (in the same box). This process will continue until the equation is fully solved.
10. Once the equation is solved, the packets will be returned to where they started, and everyone will look over the work done and the class will discuss any common mistakes.

**Closure:**
11. Students will work independently to complete the exit ticket.
<table>
<thead>
<tr>
<th>Assessments</th>
<th>Informal – Completion of warm-up, roundtable activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Formal – Exit ticket</td>
</tr>
</tbody>
</table>
Materials

Blooket

Link: https://www.blooket.com/

- Create a username and password to login and make a free account
- Search the name below in the “discover” tab to find the game
Blooket Continued

4. Distribute
10(x + 2)

10x + 20
12x
8x
10x + 2

5. Distribute
-1(y + 7)

8y
7y
-7y
y + 8

6. Distribute
5(2r - 8)

7r - 3
10r - 40
10r - 8
3r + 13

7. Solve the equation for x
4x = 12

x = 16
x = 3
x = 8
x = 48

8. Solve the equation for y
\frac{y}{5} = 7

y = 42
y = 1
y = 13
y = \frac{7}{6}

9. Solve the equation for n
n + 9 = 14

n = 23
n = 126
n = 5
n = 4
Blooket Continued

10. Solve the equation for $x$
   
   \[2x - 10 = 30\]
   
   - $x = 2$
   - $x = 10$
   - $x = 80$
   - $x = 20$

11. Solve the equation for $r$
   
   \[\frac{r}{4} + 6 = 10\]
   
   - $r = 80$
   - $r = 16$
   - $r = 1$
   - $r = 8$

12. Solve the equation for $k$
   
   \[8k - 3 = 21\]
   
   - $k = 3$
   - $k = 192$
   - $k = 2$
   - $k = 33$
Warm-up/Introduction Slides:
- Slides 17-18

Link: https://docs.google.com/presentation/d/1UoH6sSCW2knhrw-9mVTtEWMUdwPWYLjFn8czvd5HHA/edit?usp=sharing
Roundtable Presentation Slides

Link:
https://docs.google.com/presentation/d/1ZM6o727dJCnbduo9XISf4QP61RdD79wAGzpPnb5ORCg/edit?usp=sharing

---

**Solving Linear Equations**
Roundtable Activity

1. Write one step toward solving the equation.
2. When everyone is ready, pass your sheet and get a new sheet.
3. Check the work on this sheet.
4. Write one more step toward solving the equation on this paper.
5. Repeat until every equation is solved.
6. Get your original paper back and check it.

---

**Correcting Your Classmates Work:**

1. Use your colored pen if you think there are any mistakes.
2. Be respectful if other work is mistaken.
3. Don’t breeze someone’s work. Pretend you are “grading” it!
4. If you are unsure, ask a peer or check with a teacher before correcting it.

**Are You Ready?**
When the equation is presented, write it in box one and complete the first step to solve it.

Then stop!!

---

**Equation 1**

\[3x + 5x = 48\]

Answer: \(x = 6\)

---

**Equation 2**

\[4(y + 2) = 20\]

Answer: \(y = 3\)
Roundtable Presentation Slides Continued

\[ 7x + 2(x - 3) = 75 \]
Answer: \( x = 9 \)

\[ 5(2a + 1) + 6 = 31 \]
Answer: \( a = 2 \)

\[ 9(3x - 7) - 12x = -3 \]
Answer: \( x = 4 \)

GREAT TEAMWORK!
Roundtable

Group Members: ______________________________

Directions: An equation will be presented on the board to solve. When presented, copy the equation into box #1 below. When instructed, pass your packet to a classmate. Then, you will complete the next step for solving the equation in your classmate’s packet. Continue this rotation until the problem is solved.

#1
#4

#5
Exit Ticket

Solve the multi-step equation below (show ALL work!)

\[ x + 5(x - 4) + 6 = 34 \]
Classroom Implementation

To ensure student success with this curriculum, these lessons are to be taught after students have mastered operations with polynomials. Once students have the foundation of combining like terms, the distributive property, and various operations with polynomials, this curriculum eases them into solving equations. The sequence of these lessons allows for student learning to progress through the new skill of using inverse operations as it gets more in depth.

The structure of using the 5E model along with group activities assists students through the progression solving equations at a reasonable pace. Students are given opportunities to use their prior knowledge to discover new concepts on their own as they share their thoughts with the class. During the “engage” and “explore” phases of the lessons, it is important to encourage students to share their thinking so you can build off their thoughts and push them towards the desired outcome. If students are struggling to make these discoveries on their own, be sure to prompt them using knowledge they have without giving too much new information. This will ensure that they don’t miss the explore phase of the model. Some students will have a harder time seeing the connections we are intending them to make. If necessary, include some partner discussion during these phases of each lesson so the students can assist one another in these discoveries.

During the explain phase, you will be teaching the new skill that you just assisted students in making connections to. It is important that you use student ideas from the previous phases as you teach so you can have students contribute to your lessons. Using their input will increase their confidence and encourage more participation in the future. The more confidence you can instill in your students, the more they will benefit from this type of model.
The last two phases will involve practice of the newly learned skills as they connect with previously learned skills. During the elaborate and evaluate phases, the teacher takes a step back and allows the students to work together as they apply these new skills. You have the choice of how you want to pair students during the group activities. You can pair based on ability so you can assist the lower-leveled groups while the others are working independently. You can also mix the groups so students of all levels can help one another. As the teacher, you want to facilitate the group/partner work during the activities. It is important during these phases to focus on how students are working in their groups and communicating with one another. Observe who is having a difficult time with the concept and who has grasped the new skill. Then, use these pairings to your advantage. As opposed to you, the teacher, assisting struggling students, have those who are demonstrating conceptual understanding of the skill assist those who are having difficulty. This facilitation will allow students to think of each other as a resource as opposed to always looking to the teacher for assistance.

The evaluation phase will show who truly understood the topic and who needs additional support. After looking over the formative assessments at the closure of each lesson, you can rearrange groups or partners based on students who seem to have the weaker foundational skills needed for the progression of the lessons. This model allows you to still move forward in the curriculum while using your higher-leveled students to keep others at the same pace.

**Conclusion**

The goal of this curriculum is to demonstrate for mathematics teachers how the 5E instructional model can be implemented into the classroom through simple adjustments to existing curriculum. This project provides multiple examples of how to center learning around your students’ ideas and discoveries, which is designed to increase conceptual understanding of
new concepts. The answer keys for all worksheets, assignments, activities, and assessments can be found in the appendix. As the author of this project, my hope is that mathematics teachers who access this curriculum project can utilize these lessons and materials in their own classroom and continue working with the models presented.
References


Appendix

Solving Linear Equations

Lesson 1 - Solving One-Step Equations

<table>
<thead>
<tr>
<th>Standard</th>
<th>AI-A.REI.3 - Solve linear equations in one variable, including equations with coefficients represented by letters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson Objective</td>
<td>Students will be able to solve one-step linear equations using inverse operations.</td>
</tr>
</tbody>
</table>

Identify the four basic operations and their opposites:

 Addition ——— Subtraction
 Subtraction ——— Addition
 Multiplication ——— Division
 Division ——— Multiplication

Solving One-Step Equations

1. Undo the addition or subtraction by using inverse operations.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Equation</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$d + 10 = 25$</td>
<td>$d = 15$</td>
</tr>
<tr>
<td>2</td>
<td>$y - 4 = 7$</td>
<td>$y = 11$</td>
</tr>
<tr>
<td>3</td>
<td>$6 + x = 12$</td>
<td>$x = 6$</td>
</tr>
<tr>
<td>4</td>
<td>$-5 + g = 8$</td>
<td>$g = 13$</td>
</tr>
</tbody>
</table>
You Try!

5. \[ \frac{x + 8 = 30}{\text{ } -8}{\text{ } -8} \]
   \[ \frac{x = 22}{\text{ }} \]

6. \[ \frac{b - 3 = 4}{\text{ } +3}{\text{ } +3} \]
   \[ \frac{b = 7}{\text{ }} \]

7. \[ \frac{2 + y = 12}{\text{ } -2}{\text{ } -2} \]
   \[ \frac{y = 10}{\text{ }} \]

8. \[ \frac{-4 + d = 16}{\text{ } +4}{\text{ } +4} \]
   \[ \frac{d = 20}{\text{ }} \]

2. Undo the division or multiplication by using inverse operations.

* To “get rid” of a fraction, multiply by the reciprocal.

1. \[ \frac{5y = 25}{\text{ } 5}{\text{ } 6} \]
   \[ \frac{y = 5}{\text{ }} \]

2. \[ \frac{3 \cdot k}{\text{ } 3}{\text{ } 9 \cdot 3} \]
   \[ \frac{k = 27}{\text{ }} \]

3. \[ \frac{-3x = 36}{\text{ } -3}{\text{ } -3} \]
   \[ \frac{x = -12}{\text{ }} \]

4. \[ \frac{5 \cdot \frac{g}{5}}{\text{ } 5}{\text{ } 6 \cdot 5} \]
   \[ \frac{g = 30}{\text{ }} \]

You Try!

5. \[ \frac{6n = 24}{\text{ } 6}{\text{ } 6} \]
   \[ \frac{n = 4}{\text{ }} \]

6. \[ \frac{4 \cdot b}{\text{ } 4}{\text{ } 7 \cdot 4} \]
   \[ \frac{b = 28}{\text{ }} \]

7. \[ \frac{-10x = 50}{\text{ } -10}{\text{ } -10} \]
   \[ \frac{x = -5}{\text{ }} \]

8. \[ \frac{2 \cdot \frac{g}{2}}{\text{ } 2}{\text{ } 10 \cdot 2} \]
   \[ \frac{g = 20}{\text{ }} \]
### Solving One-Step Equations
#### Scavenger Hunt

Directions: Use this sheet to record your work during the scavenger hunt. Copy down the problem and solve it in the box. Circle your final answer.

*Equations do not have to be in order.*

<table>
<thead>
<tr>
<th>Equation</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \frac{4x}{4} = \frac{20}{4} )</td>
<td>( x = 5 )</td>
</tr>
<tr>
<td>( x + 5 = 13 )</td>
<td>( x = 8 )</td>
</tr>
<tr>
<td>( \frac{x - 8}{8} + 8 )</td>
<td>11</td>
</tr>
<tr>
<td>( \frac{2 \cdot x}{2} = 10 \cdot 2 )</td>
<td>( x = 20 )</td>
</tr>
<tr>
<td>( \frac{7x}{7} = \frac{49}{7} )</td>
<td>( x = 7 )</td>
</tr>
<tr>
<td>( \frac{x + 12}{12} = 6 )</td>
<td>( x = -6 )</td>
</tr>
<tr>
<td>Equation</td>
<td>Solution</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>( x - 3 = 15 ) [ x = 18 ]</td>
<td>( 6 \cdot \frac{x}{6} = -4 \cdot 6 ) [ x = -24 ]</td>
</tr>
<tr>
<td>( \frac{9x}{9} = \frac{36}{9} ) [ x = 4 ]</td>
<td>( x + 14 = -24 ) [ x = -38 ]</td>
</tr>
<tr>
<td>( x - 1 = -1 ) [ x = 0 ]</td>
<td>( 5 \cdot \frac{x}{5} = 12 \cdot 5 ) [ x = 60 ]</td>
</tr>
<tr>
<td>Extra</td>
<td>Extra</td>
</tr>
</tbody>
</table>
Exit Ticket

Solve the one-step equations below using inverse operations:

1. \[ x + 5 = 20 \]
   \[ -5 \]
   \[ x = 15 \]

2. \[ d - 12 = 6 \]
   \[ +12 \]
   \[ d = 18 \]

3. \[ \frac{4x}{4} = \frac{28}{4} \]
   \[ x = 7 \]

4. \[ 3 \cdot \frac{k}{3} = 7 \cdot 3 \]
   \[ k = 21 \]
Lesson 2 - Solving Two-Step Equations

<table>
<thead>
<tr>
<th>Standard</th>
<th>AI-A.REI.3 - Solve linear equations in one variable, including equations with coefficients represented by letters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson Objective</td>
<td>Students will be able to solve two-step linear equations using inverse operations.</td>
</tr>
</tbody>
</table>

What are the steps for solving one-step equations?

1. Undo **addition** by **subtracting** the constant from both sides of the equation.
2. Undo **subtraction** by **adding** the constant on both sides of the equation.
3. Undo **division** by **multiplying** the coefficient on both sides of the equation.
4. Undo **multiplication** by **dividing** the coefficient from both sides of the equation.

Solving Two-Step Equations

1. Undo the **addition** or **subtraction** by using inverse operations.
2. Undo the **multiplication** or **division** by using inverse operations.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 1 | $2x + 5 = 25$
|   | $-5$  
|   | $\frac{-5}{2}x + \frac{20}{2}$
|   | $x = 10$
| 2 | $\frac{d}{2} + 8 = 12$
|   | $\frac{-8}{2}$  
|   | $\frac{-8}{2} = 4 - 2$
|   | $d = 8$
| 3 | $5y - 3 = 7$
|   | $\frac{+3}{5}$  
|   | $\frac{+3}{5}y + \frac{10}{5}$
|   | $y = 2$
| 4 | $\frac{m}{3} - 12 = 6$
|   | $\frac{+12}{3}$  
|   | $\frac{+12}{3} = 18 - 3$
|   | $m = 54$
### You Try!

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>$3x + 8 = 26$</td>
<td>6</td>
<td>$\frac{d - 4}{7 - y} = \frac{9}{y}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$-\frac{8}{3}$</td>
<td></td>
<td>$-\frac{3}{7} = \frac{5}{y}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\frac{8}{3}x = 18$</td>
<td></td>
<td>$d = 35$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$x = 6$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>$7y - 10 = 25$</td>
<td>8</td>
<td>$\frac{p + 2}{7 - 2} = \frac{3}{2}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$+\frac{10}{10}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\frac{7y}{7} = 5$</td>
<td></td>
<td>$p = 7$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$y = 5$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Extra Practice

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>$x + \frac{x}{2} = 14$</td>
<td>11</td>
<td>$\frac{8 - n}{n} = \frac{20}{2}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$-\frac{10}{2} = -5$</td>
<td></td>
<td>$-n = \frac{10}{2}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\frac{x}{2} + \frac{2}{2} = 8$</td>
<td></td>
<td>$-n = -10$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$x = 8$</td>
<td></td>
<td>$n = -10$</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>$23 + n = 13$</td>
<td>14</td>
<td>$\frac{5 - y}{10} = \frac{8}{10}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$-\frac{23}{10} = -2.3$</td>
<td></td>
<td>$-5 = -5$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$n = -10$</td>
<td></td>
<td>$-10 = -10$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$y = -10$</td>
<td></td>
<td>$y = -30$</td>
<td></td>
</tr>
</tbody>
</table>
Escape Room
Solving Two-Step Equations

Directions: Solve the following equations to get the code to escape Room 1. Once you get the code, type it into the google form to see if you are correct. Follow the directions on the form.

1) \(2x + 4 = 10\)  \(x = \frac{3}{2}\)

2) \(6x - 1 = 29\)  \(x = 5\)

3) \(3x - 8 = 13\)  \(x = 7\)

4) \(9x + 5 = 23\)  \(x = 2\)

Code: \(\frac{3}{1} \frac{5}{2} \frac{7}{3} \frac{2}{4}\)
Escape Room

Solving Two-Step Equations

Directions: Solve the following equations to get the code to escape Room 2. Once you get the code, type it into the google form to see if you are correct. Follow the directions on the form.

1) \( \frac{x}{3} - 1 = 2 \)  \( x = 9 \)

2) \( \frac{x}{2} + 10 = 12 \)  \( x = 4 \)

3) \( \frac{x}{5} + 8 = 9 \)  \( x = 5 \)

4) \( \frac{x}{7} + 5 = 6 \)  \( x = 7 \)

Code: 9 4 5 7

1 2 3 4
Solving Two-Step Equations

**Escape Room**

**Directions:** Use this sheet to show your work as needed for the escape room activity.

(Although optional for students to show work)

<table>
<thead>
<tr>
<th>Room 1</th>
<th>Room 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (2x + 4 = 10) (-4) (-4) (\frac{2x}{2} = \frac{6}{2}) (x = 3)</td>
<td>1. (\frac{x}{3} - 1 = 2) (+1) (+1) (\frac{3}{3} \cdot \frac{x}{3} = \frac{3}{3} \cdot 3) (x = 9)</td>
</tr>
<tr>
<td>2. (6x - 1 = 29) (+1) (+1) (\frac{6x}{6} = \frac{30}{6}) (x = 5)</td>
<td>2. (\frac{x}{2} + 10 = 10) (-10) (-10) (\frac{x}{2} = \frac{0}{2}) (x = 4)</td>
</tr>
<tr>
<td>3. (3x - 8 = 13) (+8) (+8) (\frac{3x}{3} = \frac{21}{3}) (x = 7)</td>
<td>3. (\frac{x}{5} + 8 = 9) (-8) (-8) (\frac{x}{5} = \frac{1}{5}) (x = 5)</td>
</tr>
<tr>
<td>4. (9x + 5 = 23) (-5) (-5) (\frac{9x}{9} = \frac{18}{9}) (x = 2)</td>
<td>4. (\frac{x}{7} + 5 = 10) (-5) (-5) (\frac{7x}{7} = \frac{7}{7}) (x = 1)</td>
</tr>
</tbody>
</table>
Lesson 3 - Solving Multi-Step Equations

<table>
<thead>
<tr>
<th>Standard</th>
<th>A1-A.REI.3 - Solve linear equations in one variable, including equations with coefficients represented by letters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson Objective</td>
<td>Students will be able to solve multi-step linear equations by combining like terms and using inverse operations.</td>
</tr>
</tbody>
</table>

How would you simplify the following expression?

\[ 2x + 5x = 7x \]

- This process is called **combine like terms**

Try solving the following equation based on what you know about combining like terms and inverse operations:

\[
\begin{align*}
4x + 2x - 10 &= 50 \\
\downarrow & \\
(\underline{6x} - 10) &= 50 \\
+10 & \\
\underline{6x} &= 60 \\
\downarrow & \\
\underline{x} &= \underline{10}
\end{align*}
\]
Solving Multi-Step Equations

Steps:

1. **Combine** like terms

2. **Solve** for the variable using inverse operations

\[
\begin{align*}
\text{①} & & 10x + 6x &= 64 \\
& & \frac{16x}{16} &= \frac{64}{16} \\
& & x &= 4
\end{align*}
\]

\[
\begin{align*}
\text{②} & & 2x + 1 - 5 &= -20 \\
& & \frac{2x - 4}{2} &= \frac{-16}{2} \\
& & x &= -8
\end{align*}
\]

\[
\begin{align*}
\text{③} & & 4m - 6m + 2 &= 50 \\
& & -2m + 2 &= 50 \\
& & -2m &= 48 \\
& & m &= -24
\end{align*}
\]

\[
\begin{align*}
\text{④} & & 3a + 3 &= 27 \\
& & 3a &= 24 \\
& & a &= -8
\end{align*}
\]
You Try!

5. \(-12y + 6y = 42\)
   
   \[
   \begin{align*}
   -12y + 6y &= 42 \\
   -12y &= 42 \\
   y &= -7
   \end{align*}
   \]

6. \(5r - r + 16 = 24\)
   
   \[
   \begin{align*}
   5r - r + 16 &= 24 \\
   4r &= 8 \\
   r &= 2
   \end{align*}
   \]

7. \(-9x + 14 = 83\)
   
   \[
   \begin{align*}
   -9x &= 83 - 14 \\
   -9x &= 69 \\
   x &= -7
   \end{align*}
   \]

8. \(-3n - 7 - 3n + 4 = 25\)
   
   \[
   \begin{align*}
   -7n - 3 &= 25 \\
   -7n &= 28 \\
   n &= -4
   \end{align*}
   \]

Extra Practice

9. \(8x - 3x + 12 - 3 = 79\)
   
   \[
   \begin{align*}
   5x + 9 &= 79 \\
   5x &= 70 \\
   x &= 14
   \end{align*}
   \]

10. \(116 = -25n + 7 - 2n + 1\)
    
    \[
    \begin{align*}
    116 &= -27n + 8 \\
    -8 &= -8 \\
    108 &= -27n \\
    -4 &= n
    \end{align*}
    \]
Exit Ticket

Solve the multi-step equation below (show ALL work!)

\[
(4x - 20 + 6x) = 50
\]

\[
16x - 20 = 50
\]

\[
+20
\]

\[
16x = 70
\]

\[
\frac{10x}{10} = \frac{70}{10}
\]

\[
x = 7
\]
Lesson 4 - Solving Multi-Step Equations

<table>
<thead>
<tr>
<th>Standard</th>
<th>AI-A.REI.3 - Solve linear equations in one variable, including equations with coefficients represented by letters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson Objective</td>
<td>Students will be able to solve multi-step linear equations using the distributive property, combining like terms, and inverse operations.</td>
</tr>
</tbody>
</table>

How would you simplify the following expressions?

1. \(3(x + 2) = 3x + 6\)
2. \(4(x - 5) = 4x - 20\)

☆ This property is called **distributive property**

Try solving the following equation based on what you know about the distributive property, combining like terms and inverse operations:

\[
2(x + 3) + x = 18
\]

\[
2x + 6 + x = 18
\]

\[
3x + 6 = 18
\]

\[
x = 4
\]
Solving Multi-Step Equations

Steps:
1. Distributive (if necessary)
2. Combine like terms
3. Solve for the variable using inverse operations

\begin{align*}
\text{① } -7(3x - 1) &= 91 \\
-21x + 7 &= 91 \\
-21x &= 84 \\
x &= -4
\end{align*}

\begin{align*}
\text{② } 2(x + 1) &= -20 \\
2x + 2 &= -20 \\
2x &= -22 \\
x &= -11
\end{align*}

\begin{align*}
\text{③ } 5(3m + 10) &= 125 \\
15m + 50 &= 125 \\
15m &= 75 \\
m &= 5
\end{align*}

\begin{align*}
\text{④ } 3a + 2(5a - 3) &= 7 \\
3a + 10a - 6 &= 7 \\
13a &= 13 \\
a &= 1
\end{align*}
You Try!

5. 
\[-4(7y + 5) = -160\]
\[-28y - 20 = -160\]
\[+20 +20\]
\[-28y = -140\]
\[\frac{-28y}{-28} = \frac{-140}{-28}\]
\[y = 5\]

6. 
\[-3(n + 7) = -6\]
\[-3n - 21 = -6\]
\[+21 +21\]
\[-3n = 15\]
\[\frac{-3n}{-3} = \frac{15}{-3}\]
\[n = -5\]

7. 
\[4(2x - 1) = 44\]
\[8x - 4 = 44\]
\[+4 +4\]
\[8x = 48\]
\[\frac{8x}{8} = \frac{48}{8}\]
\[x = 6\]

8. 
\[k - 3(2k - 7) = 76\]
\[k - 6k + 21 = 76\]
\[\frac{-5k + 21}{-5} = \frac{76}{-5}\]
\[\frac{-5k}{-5} = \frac{55}{-5}\]
\[k = -11\]

Extra Practice

9. 
\[15 - 5(4x - 7) = 50\]
\[15 - 20x + 35 = 50\]
\[50 - 20x = 60\]
\[\frac{-20x}{-20} = \frac{60}{-20}\]
\[x = 0\]

10. 
\[4 = 16y - 4(5y - 7)\]
\[4 = 16y - 20y + 28\]
\[\frac{4}{-4} = \frac{-16y + 28}{-4}\]
\[y = 6\]
# Hangman

**Solving Multi-Step Equations**

**Directions:** You and your partner will try to figure out the Hangman's favorite food by solving the equations below. One partner will start by choosing a letter and solving that equation. When you get the answer, see if it matches any of the Hangman's letters. If yes, write the letter on the line. If not, draw a part of the Hangman's body and your partner will choose the next letter. Good luck!

<table>
<thead>
<tr>
<th>A</th>
<th>M</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>5x + 2(x-3) = 50</td>
<td>6(3-x) = 54</td>
<td>5(x-4) = 30</td>
</tr>
<tr>
<td>I</td>
<td>O</td>
<td>N</td>
</tr>
<tr>
<td>8x - x = 2.8</td>
<td>2(x+3) - 4 = 36</td>
<td>-12x + 20x = 40</td>
</tr>
<tr>
<td>L</td>
<td>P</td>
<td>C</td>
</tr>
<tr>
<td>9(x-1) + 5x = 33</td>
<td>-4(2x+1) = 76</td>
<td>3 - 7(x-5) = 73</td>
</tr>
<tr>
<td>R</td>
<td>W</td>
<td>E</td>
</tr>
<tr>
<td>10 - 2(6x-2) = 12.2</td>
<td>-(x-2) + 3x = 2.8</td>
<td>6(7x-8) = -6</td>
</tr>
<tr>
<td>T</td>
<td>U</td>
<td>Y</td>
</tr>
<tr>
<td>8(x+9) = 88</td>
<td>4(3x-5) = 104</td>
<td>36x + 4x = -12.0</td>
</tr>
<tr>
<td>Z</td>
<td>H</td>
<td>S</td>
</tr>
<tr>
<td>-2x + 3(2-4x) = 160</td>
<td>18x - 6x = 72</td>
<td>12 - 3(x-1) = 2.7</td>
</tr>
</tbody>
</table>

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TACOS

x=2  x=8  x=-5  x=10  x=-4
Exit Ticket

Solve the multi-step equation below (show ALL work!)

\[ 3(x + 5) - 2 = 40 \]

\[ 3x + 15 - 2 = 40 \]

\[ 3x + 13 = 40 \]

\[ 3x = 27 \]

\[ x = 9 \]
ROUND TABLE

Group Members: ______________________

Directions: An equation will be presented on the board to solve. When presented, copy the equation into box #1 below. When instructed, pass your pocket to a classmate. Then, you will complete the next step for solving the equation in your classmate's pocket. Continue this rotation until the problem is solved.

#1 \[ 3x + 5x = 48 \]

\[
\begin{align*}
8x &= \frac{48}{8} \\
\hline
8
\end{align*}
\]

\[ x = 6 \]
#2
\[4(y + 2) = 20\]
\[4y + 8 = 20\]
\[-8 \quad -8\]
\[4y = 12\]
\[\frac{4y}{4} = \frac{12}{4}\]
\[y = 3\]

#3
\[7x + 2(x - 3) = 75\]
\[7x + 2x - 6 = 75\]
\[9x - 6 = 75\]
\[+6\]
\[9x = 81\]
\[\frac{9x}{9} = \frac{81}{9}\]
\[x = 9\]
#4

\[5(2a + 1) + 6 = 31\]

\[10a + 5 + 6 = 31\]

\[10a + 11 = 31\]

\[-11\]

\[10a = 20\]

\[\frac{10}{10}\]

\[a = 2\]

#5

\[9(3x - 7) - 12x = -3\]

\[27x - 63 - 12x = -3\]

\[15x - 63 = -3\]

\[+ 63 \quad + 63\]

\[\frac{15x = 60}{15}\]

\[x = 4\]
Exit Ticket

Solve the multi-step equation below (show ALL work!)

\[ x + 5(x - 4) + 6 = 34 \]

\[ x + 5x - 20 + 6 = 34 \]

\[ 6x - 14 = 34 \]

\[ 6x = 48 \]

\[ x = 8 \]